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THE MATERIAL RESPONSE OF THE POLAR ESKIMO TO THEIR FAR ARCTIC ENVIRONMENT*

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PREFACE

The Eskimo are a vanishing race. Since they were first recorded in modern history their number has constantly declined throughout their range except in Greenland; there, as elsewhere, they are losing their racial character, and becoming alien in blood, though retaining their name. The native culture, in its fundamental phases, is surviving better than the blood, and yet it too is being profoundly modified by the introduction of foreign equipment and customs.

Though this culture has probably survived longer with the Polar Eskimo than with any other Eskimo group, even with them the change has been proceeding rapidly in the last decade or two, particularly since the establishment of a mission station and a trading factory in Thule. In the beginning years of their transition, while still they retained in large measure the pristine simplicity and directness of relationship to their environment, I dwelt among them continuously for four years as one of their group, frequenting their homes, eating their food, wearing their dress, driving their dogs, and sharing their hunting grounds and the activities of the trail. Impressed with the opportunity thus presented me for studying at first hand the indubitable influence of their native land upon their material culture I observed carefully and, I hope critically, the details of this relationship. In this paper I can at best but attempt to present the more significant features in the material responses of the Polar Eskimo to their Thule habitat.

To the American Museum of Natural History of New York I would cordially express my obligation, not only for permission to quote liberally from the manuscript of my geographic report on the work of the Crocker Land Expedition, but also for the liberal support it has always accorded me in all my Arctic research. The Museum, aided by the American Geographic Society and the University of Illinois, financed the Crocker Land Expedition through to the end, and since then has borne the burden of preparing for publication the results obtained. To my colleagues on the staff of the Graduate School of Geography of Clark University, particularly to Miss Ellen C. Semple, who scrutinized critically much of the manuscript, I am also indebted for suggestions and help.

INTRODUCTION

The Polar Eskimo dwell farther north than any other people. Far within the Arctic Circle, not a thousand miles from the Pole, they have made their homes and gained their livelihood upon the high rocky fringe of shorelands and the ice bound waters of northwest Greenland lying between Kane Basin to the north and Melville Bay to the south, a region which the Danes, who now hold sovereignty over the land, have designated Thule.



MAP OF THULE AND ENVIRONS

Figure 1. Thule, the land of the Polar Eskimo, comprises a prominent peninsula at the northwest corner of Greenland where Inglefield Land is separated from Ellesmere Land by the narrow waters of Smith Sound. The position of the area included within the larger map is indicated by the black square in the inset map.

THULE: THE LAND OF THE POLAR ESKIMO.—Thule is a broad peninsular plateau, deeply dissected, lying between the 76th and the 79th parallels, and constituting the westernmost extension of Greenland. Etah, the best known of the Eskimo villages, has almost exactly the same longitude as New York, and the same latitude as Cape Chelyuskin, the northernmost point of Siberia. This broad peninsula is bisected by Inglefield Gulf into two almost equal and similar lobes; the northern lobe is indented by numerous narrow fjords and bays, and the southern lobe is bisected by Wolstenholme Sound and cut by many deep narrow fjords. The plateau constitutes the surface of an old peneplain base-leveled except for scattered monadnocks, and later uplifted above sea-level from 2,000 to 4,000 feet. A number of rocky skerries and islets lie along the coast and larger islands occupy the mouths of the major bays and gulfs.

The coast line of Thule and its islands extends over 750 miles, in a general northwest-southwest direction. Rocky promontories and precipitous cliffs front the sea, their longest and steepest stretches facing the noonday sun. In places the cliffs, withdrawn somewhat from the shore, leave a narrow foreland of broken talus like a threshold at their foot; here and there a gorge opens a gap in the steep rock walls, and the summer torrents that cut the gorge build a small stony delta into the sea. In some of the larger inlets, low flat valleys of rounded profile open out upon the sea, their terraced slopes a palimpsest of marine activity upon the graven record of former glaciers.

Back of Thule and projecting far out upon its several lobes, the edge of the Greenland ice cap delimits the fringe of ice-free land and circumscribes landward the hunting grounds of the Polar Eskimo. In places the ice cap presses down to the shore; in places it withdraws many miles inland; but everywhere it lies so near that in summer or winter, by sunlight or moonlight, its gleaming slopes mark the eastern horizon from every eminence.

Before Thule, northern Baffin Bay, the "North Water" of the whalers, remains open throughout the year, for the tides sweep back and forth through Smith Sound between Kane Basin and Baffin Bay with such velocity that ice may never form even in the coldest and calmest winters. Open water is thus never far distant from the outermost islands and promontories, but in all the fjords and bays and in most of the straits, the ice forms in late August or early September and remains fairly sound and unbroken until the following late June or early July, when it usually disappears; and generally along most of the coast a fringe of ice varying in width from a few hundred rods to several miles

lies more or less continuous throughout the same period. The icefoot, that portion of the sea ice which freezes fast to the shore, and does not rise and fall with the ice on the sea, often remains long after the sea ice proper has broken up and drifted away.



Courtesy of American Museum of Natural History.

Figure 2. A typical view of the Thule coast with all the elements of landscape that make the Far Arctic distinctive—the glacier emerging from the ice cap between high stern cliffs upon a sea studded with bergs, and over all the luminous sky effects that characterize polar regions.

The sea ice rarely breaks out suddenly, or all at once. It begins melting under the rays of the rising sun of May and even earlier, by the cutting of the tides beneath. When fresh water flows out over it from melting snow and ice on the land or from bergs on the sea, the sea ice breaks up more rapidly. Open pools and cracks form which expedite the disintegration. By mid-July nearly all the sea ice is adrift and the bays and gulfs are open. Late July, all of August, and early September generally constitute the season of maximum open water and minimum ice, though bergs may be many and floes and fields extensive. Except when the water is unusually free from ice, it rarely becomes very rough, though occasionally it is lashed into wildest surge and broken wave by violent southwestern storms.

Thus Thule, the land of the Polar Eskimo, is a mere narrow ice free coastal fringe of ice mantled plateau, deeply dissected, bounded by high

cliffs along the coast and trenched by deep gorges from the edge of the ice cap to the sea. Their seas are but an ice rimmed tidal race where the waters run too fast to freeze, and ice bound bays and gulfs and near shore waters that open reluctantly for only two brief months of summer, and for the other ten months are snow drifted expanses of unbroken ice, here and there piled into a cordilleran chaos of high hummocks or crossed by pressure ridges, row upon row.

THE POLAR ESKIMO: ARCTIC FRONTIERSMEN.—The Polar Eskimo hold the frigid outposts of human life on the far Arctic frontier. A little group of two hundred fifty persons, probably never many more, certainly often many less, they have maintained themselves and survived through centuries almost five hundred miles farther north than any other permanently resident people in the world.

Isolated for many centuries by the rough, treacherous ice of Melville Bay from their nearest neighbors, their kinsmen of the Danish colonies, and set far aside from the trade routes and traveled ways of the busy world of the Southlands, they constitute a distinct social and economic group, unique, and unmodified by alien or exterior influences of any kind until discovered by the white man early in the nineteenth century. Their culture is fundamentally similar to that of their race, of which their group is the northernmost and in some ways the most primitive member, a culture shaped by the character of the polar lands which the race has occupied; but upon this racial culture of the Polar Eskimo are superimposed the distinctive traits and attributes that reflect the environment peculiar to Thule itself. Their food, their clothing, their fuel, their habitations, and their artifacts are directly the products of their own land; their customs, their language, their religion, their way of thinking even, reflect only the simple and direct influence of their own rigorous environment.

In a broad way the Polar Eskimo are typical of their race. In essential physical characteristics and mental attributes they resemble not only their near neighbors, but the most remote groups; for the whole Eskimo race is distinguished by a remarkable homogeneity of character, culture, and language throughout its extensive range. The land in which the Polar Eskimo live, though the northernmost limit of Eskimo habitation, is similar to the lands the race occupies elsewhere—an Arctic coast with the physical conditions of a polar frontier. The response of the Polar Eskimo to their environment is similar to the response of the race in general, but with distinctive local adaptations



Courtesy of American Museum of Natural History.

Figure 3.—A representative Arctic type, a young woman in her prime. Her teeth, like those of all the Eskimo, are excellent despite no acquaintance with toothbrush or dentist. Her *kapetak*, or foxskin coat, is sewed from ten blue foxskins, and is worth a prince's ransom.

to distinctive local conditions resulting from their extreme frontier position.

The original homeland of the Eskimo, from which they wandered over the whole Arctic coast of North America from the Gulf of St. Lawrence, the Labrador, and the eastern coast of Greenland on the east to eastern Siberia, the Aleutians and southern Alaska on the west, has not been finally determined. The consensus of opinion postulates a remote Asiatic origin and a much later dispersal from a North American center of distribution near Great Bear and Great Slave lakes, and about the sources of the many streams which flow eastward into Hudson Bay, and northward into Coronation Gulf and Maud Sea.

Whatever the place of their origin and the cause of their movement, the remarkable racial homogeneity of Eskimo character, culture, and language would indicate a relatively recent or rapid dispersal (as movements of peoples are recorded in history) from this ancestral homeland; but the fact that the territory over which they migrated was quite unoccupied and they did not come into contact with any peoples to affect them, the rate of movement may have been slower and the date of movement more remote than have been generally thought.



Courtesy of American Museum of Natural History.

Figure 4. A typical family group of father, mother, son, and daughter (in the sealskin pouch over the shoulder) standing before their little summer tent or tupik.

The northward expansion of the Athapasean Indians across the muskeg plains of Canada may have forced the Eskimo out. Because the Indian culture was dependent upon wood, the Indians did not advance northward or out upon the shores beyond the tree line. Wherever the Eskimo are in contact with the Indians in Alaska, in Canada, and in Ungava where the Nascaupis and Montaignais occupied the wooded interior, the Eskimo have been limited to the treeless coasts. They may have been lured seaward down the rivers by the richer resources of the coastal waters, as their skill in hunting on both sea and ice developed, and their ability to gain a livelihood from the sea equaled or surpassed their original skill in hunting land and river game. Meager resources, inadequate stores, and recurrent famines may have furnished frequent motive for extension of range. Whatever the cause of their dispersal they retained their shore-dwelling characteristics in all their travels and settlements, never wandering far from water, and always depending primarily upon the animals of the sea for their sustenance.

The total number of Eskimo, including all hybrids, is not more than 35,000. A decade ago their number was estimated to be 40,000, but whole groups have disappeared since then, particularly along the Labrador coast and in the Hudson Bay district. Peculiarly susceptible

to diseases that the white man introduces, lacking the immunity that comes from long exposure to contagious diseases for many generations, and having no prophylaxis, medicines, or medical care with which to combat sickness, they succumb readily to epidemics initiated by contact with aliens. Thus tuberculosis and venereal disease have killed many in the last decade, and even such minor diseases as measles, diphtheria and influenza have wrought havoc with their health and their numbers



Courtesy of American Museum of Natural History.

Figure 5. A trio of little Eskimo girls in proper feminine garb. Styles and materials never change in Thule.

The culture of the Eskimo has been admirably and ingeniously treated by Steensby. He distinguishes a Palaeoeskimo form with Indian affinities which evolved from the original culture of the Eskimo and which spread over the whole extent of the Eskimo occupation from the old ancestral seat of the race west of Hudson Bay; and a Neoeskimo form, a modification of the Palaeoeskimo type by Mongolian influences, which originated about the mouth of the Yukon, where Japanese fishermen maintained contact for a considerable period with the natives, and introduced new elements into the culture and a strong strain of Mongolian blood into the stock. The Neoeskimo culture was carried across the Archipelago and down the coast of Greenland, but failed to reach the Hudson Bay region, Baffin Land, and Labrador. The Eskimo of Danish Greenland, who represent an earlier immigration than do the

Polar Eskimo, show strong evidences of the Neoeskimo stock and culture. The Polar Eskimo reveal stronger Palaeoasiatic relationships, both in character and culture, due to the superposition by immigrants from Baffin Land of the older culture upon the Neoeskimo base.

The Polar Eskimo thus represent the northernmost station of the Palaeoeskimo culture. In their remote, isolated land, far from Mongolian and Indian influence, and only casually in contact with white civilization until quite recent times, they have preserved best the original Palaeoeskimo culture, and are probably the purest remnant of the old Palaeoeskimo stock.

VILLAGES

The impelling influences of the physical environment in the culture of the Polar Eskimo are revealed most clearly in the distribution and sites of their villages, which are determined, both in summer and winter, with a view to advantages in climate and accessibility to the sea and supply of game. That there may be no congestion of hunters at any one place to frighten the game away from hunting grounds accessible and convenient to the villages, the villages are scattered widely along the coast. Most of the essential game animals are abundant enough in the environs of Thule to sustain their number undiminished from year to year, despite the continued hunting, but they learn in time to avoid the neighborhood of the villages if pursued too persistently. The hunters must extend their activities so broadly that the game be not exhausted or driven away from the proximity of the villages. With their dogs and sledges in winter, and their kayaks in summer, the hunters range over wide territory, generally as far as they can go and return without making camp, but often so far that they are gone from home for days or even weeks at a time.

The Polar Eskimo do not reside continuously in the same village. Some villages are more or less continuously occupied year after year for many years, these being near hunting grounds where game is varied, abundant and constant. Some villages are deserted for years when the game in the neighborhood is scarce or hard to hunt, and then reoccupied. This seemingly erratic occupancy and abandonment is largely due to the vagaries of the game animals, but in some measure it is dependent upon the fitful fancy of the Eskimo.

The composition of the more permanently inhabited villages varies from year to year. Occasionally a family remains for more than one year in a village, but as a rule there is a complete change with the beginning of each summer hunting season. Only rarely does a family elect

to stay several years in any one place. This lack of permanence is due in part to the nomadic restlessness of the Eskimo temperament, but more impellingly to the desirability of obtaining at least a seasonal change in diet and the necessity of a variety in skins and furs for the several articles of dress and home furnishings, of which only a few, at best, may be obtained at any one village. To supply themselves fully with all the items of necessary clothing the Polar Eskimo must remove from one village with some certain kinds of game to another that yields other kinds, and so on indefinitely. Barter between the villages has not been developed to any extent, for the attraction of change in environment, activity, and food supply outweighs the advantages of permanent residence.



Courtesy of American Museum of Natural History.

Figure 6. The site of a summer village, with two tupiks beside a small fresh water pool from which the supply of cooking and drinking water may be obtained. The summer villages are situated on low sloping deltas from which access to the sea is easy and the view opens out over good hunting grounds.

Because of this frequent change of residence the Polar Eskimo can not accumulate any store of material possessions. When he removes from one village to another he can not be burdened with more belongings than his team of dogs and his sledge can transport, over rough ice and rocky terrain the many miles that intervene. Anything fragile would be broken; anything heavy would retard his progress, and might

thus even imperil the lives of his family and himself in time of stress or storm. Thus though he find great joy in acquisition of the moment, he must forego the satisfaction of providing adequately for the future.

Whenever a family chooses to reside a second year in the same village, it enjoys first claim upon the igloo that it has occupied; but whenever it removes to another village it may preempt one of the igloos which is being abandoned by a family moving to another village. The best interests of the whole group determine the outcome of any dispute that may arise over the occupancy of an igloo.

SUMMER VILLAGES.—The sites of the villages are rarely the same in summer and winter. In summer the tupiks, or tents, that comprise the village, are set upon some fairly level place accessible to the bird rookeries if there be any in the vicinity. If hunting on the ice during early summer constitutes a dominant activity of the village, the village is located in a place where experience has demonstrated the least possibility of dangerous leads in the nearby ice that might prove an obstacle to easy sledging to and from the hunting grounds, and where the ice itself is relatively smooth and free from soft snow. If sea hunting is likely to engage the major time of the summer season, the tupiks are situated near the earliest open water where sea game is abundant, and the water does not frequently become too rough for safe kayak paddling.

Wherever the site of the summer village, it is invariably upon the sloping beach of a stream delta or gravel bar, which presents an easy gradient up which to draw the kayaks and to drag the heavy carcasses of the sea animals killed. In addition a stream must issue near to supply adequate fresh water for cooking and drinking purposes during the open season; and finally where a gap in the coastal cliffs affords a route to the ice cap for sledging to other villages in case of need or emergency. A wide and distant view seaward is essential and the tupiks are always faced toward the approach from the sea. The sites combining these advantages have all been, or are, occupied.

WINTER VILLAGES.—The sites of the winter villages are more fixed than those of the summer villages, for the stone igloos can not be moved from place to place as the sealskin tupiks can, and the best sites having long ago been determined and occupied, the winter villages of to-day are generally located in the same places as they were centuries ago. Like the summer villages, the winter villages are situated upon slopes of relatively low gradient, readily accessible from the sea by dog sledge, and at the gaps of gorges from the ice cap, in order that a sledge route to

the ice cap may be available when the sea ice is impassable and communication must be established overland with other villages.

At this season of the year when all land waters are frozen solid the stream bed in the gorge is dry, and the supply of water for the igloos must be obtained from offshore icebergs from small pools near the village. Except where such pools of fresh water ice exist, the sites of the winter villages have been selected in part by the annual grounding of icebergs near enough to furnish the necessary potable water for the winter's use. If, as sometimes happens, the icebergs fail for any reason to ground conveniently near the village, the Eskimo either are forced to sledge their supply of ice for domestic purposes from a distance, or remove to another village.

The sites of the winter villages have also been selected with due regard for protection from wind and storm and undue cold, as well as for accessibility and proximity to productive winter hunting grounds, either where pools open in the ice, or where the open water extends in near shore. In the selection of the site due attention has also been paid to the general character of the ice itself in the neighborhood of the village. The ice must be relatively smooth and sound to permit safe and easy sledging for the period of winter occupancy of the village; it must not be covered with too deep or too soft snow; it must be permanent during the season, and not break out with every storm or change of tide. All these advantages of site have long ago been determined by the experience of the tribe.



Courtesy of American Museum of Natural History.

Figure 7. The site of a winter village with five igloos in view. The winter villages are located with a view to easy accessibility to smooth unbroken ice and good hunting grounds, where icebergs for the necessary supply of cooking and drinking water are likely to ground.

Thus the winter villages are usually located out toward the mouth of a bay or gulf, or toward some shoal upon which the icebergs ground, or some minor pool where tides or winds prevent the freezing of the ice

and provide open water haunts for the sea animals. Shelter from the coldest winter winds and heavy snowfall, exposure to the latest sunlight of fall and the earliest of spring, convenience to winter hunting grounds, ease and safety of sledge communication; these are the major considerations in determining the sites of the winter villages.

Usually the same families occupy the winter village that have spent the summer at the nearby summer village, for their caches of dovekies and murre, of eggs and skins, of seal and walrus and narwhal meat and blubber made during the summer must furnish them most of their living during the winter when even the most persistent hunting generally merely ekes out the summer stores and furnishes the fresh meat so necessary to good health. It is in the late spring when their caches of meat and blubber are practically or quite exhausted that the Eskimo feel free to desert their igloos in one village, load their possessions on their sledges, and remove to another village where they have elected to live for the next year, and set up their tupiks for the summer residence.

As the culture of the Polar Eskimo has changed through the course of time, the factors affecting their choice of village sites have varied in relative and absolute importance. Thus during a long period when the art of making the bow and arrow, the kayak, and the salmon spear had been lost as a consequence of the death of the experienced hunters by a pestilence, the summer villages had to be situated near the bird cliffs where an easily obtained food supply from day to day and for reserve storage was available; as soon as the ice broke out the lack of kayaks prevented the Eskimos' hunting seal or walrus on the water, and the lack of bows and arrows made impossible the killing of caribou which at that time roved over the land in large numbers.

Likewise since ample supplies of wood and iron brought by the white men have made possible larger and more effective sledges, firearms and ammunition have made game easier and more certain of capture, and needles, knives, matches, kerosene pressure stoves, and kerosene have led to a wide extension of the hunting range, the proximity of hunting grounds where game is abundant and regular, is not so dominant a factor as it was a half century ago when small sledges and limited equipment restricted the activities of the hunter to a much narrower range.

HABITATIONS

As the sites of the villages reveal the impelling influence of the rigorous environment of Thule, so in like measure the three typical habitations of the Polar Eskimo constitute a remarkable example of human adaptation to local and seasonal conditions of environment; the tupik

of seal skin for summer residence; the igloo of stone and turf for winter habitation; the iglooyak of snow for transient occupancy when occasion demands. These three express in domestic terms the elements in the physical environment of Thule—resources, land, and climate; and exemplify in material form the manual skill and intellectual ingenuity of the Thule people.

THE TUPIK OR SEALSKIN TENT.—According to an age-old tradition, the coming of the snow bunting in late April or May, about the time of the beginning of the midnight sun, is the signal for abandoning the igloo and moving into the tupik. When the cheerful, vibrant call of this little bird, a charming study in contrasted black and white plumage, is heard high above or from a nearby ledge, the Eskimo women at once get their tents out from storage, clear the snow away on the site chosen, and in short order have the tent ready for occupancy.



Courtesy of American Museum of Natural History.

Figure 8. The tupik or sealskin tent is made from forty to fifty sealskins carefully tanned and stretched over an arrangement of poles somewhat similar to that of an Indian tepee.

The tupik is made of many seal skins sewed into a continuous cover. The larger tents require as many as fifty or sixty skins in the making, the smaller not so many. An inner tent and an outer fly are sometimes used. The inner tent forms the continuous shelter and is the most carefully prepared. Part of the skins are scraped clean of all hair and

sewed into the front part of the tent to let the light through; the rest—those that form the rear part, and particularly those nearest the ground—are merely stretched and dried before being sewed. This inner tent is often used without the outer covering during the warm period of the summer, the outer fly being drawn over only in times of storm and upon the approach of cold weather. The fly is generally made of coarser, less carefully prepared skins. When only the roomy, inner tent is up, the interior is light and airy, a delightful place for rest and sleep; when both tent and fly are used, the interior becomes very warm as soon as the lamps are lighted, even when the sky is overcast and the wind blows cold, but it is not so light and pleasant.

The tents are stretched over the poles, with the highest part, about seven or eight feet above the ground, just within the entrance; from this higher portion the top slopes gradually toward the back, and more abruptly toward the sides, while the front is almost vertical. The tent is roughly elliptical, about fifteen feet from front to back, and twelve feet from side to side. The entrance is merely the gap between two of the lower front skins, which may be thrown back when someone is within to keep out the dogs. It is usually laced close and a heavy skin lashed over the front when the occupants are away. The edges of the tent are held down by rocks. When a violent wind blows and tears at the tent, sledge lines or harpoon lines are wound about it, and tied to heavy rocks to anchor it.

The rear half of the tents is occupied by a capacious bed platform of flat sandstone blocks ingeniously fitted together, that rises four or five inches above the ground floor of the tent. On either side of the door stand smaller platforms upon which the lamps and the few necessary household utensils are placed. The bed platform is covered with clean, dried grass, upon which sealskins or caribou hides are spread flat, and covers of caribou skin, bear skin, or musk ox skin are piled up at the rear for cold weather. Sometimes the sleeping bags used on the sledge trail through the cold season are slit partly open for bed covers in the tupik. They can not be carried along on the kayak hunts.

Whenever the weather is mild and pleasant the tupik is practically unoccupied, for all the household duties—tanning, cooking, sewing—are conducted outdoors; indoor activities are reduced to the minimum. In inclement weather the lamps are kept burning in the tupik, as in the igloos in winter, and the work is done inside. The women try to adapt their work to the weather, reserving their sewing for indoor industry, and tanning, drying, and shaping skins for outdoor occupation.

The occupancy of the summer tupik embraces the whole season of twenty-four hour a day sunshine and continues almost but not quite to the beginning of the season of twenty-four hour a day absence of sun. The latter is very near October 21, the former very near April 21. On or about April 21 at Thule the sun merely dips down to the horizon due north at midnight, and begins at once to rise to another circle a little higher than the day before. Day by day it rises in the sky until the summer solstice, when the full glory of Arctic day with the sun at maximum meridian height floods the whole "top of the world" within the Arctic circle.

For two months more the twenty-four hour sunlight continues, but through these two months the daily circle sweeps nearer and nearer the horizon, finally to dip down below it due north at midnight on August 21. As the midnight sun sinks down behind the high cliffs, the long east-west fjords are veiled in shadow and grow so cold that ice begins to form, and the inland lakes set among the high hills fast freeze solid. Winter begins to come as soon as the sun begins to set, and the Eskimo women know that soon they must begin rebuilding the igloos.

After August 21, the midnight twilight is bright for yet two weeks, and though the sun sets for a longer time each night there is but little darkness until the autumnal equinox, and then it is only a heavy gray dusk at midnight. But after September 21, night, such as it is, comes on apace and the winter begins in real earnest. All the streams freeze solid, there is no melting even at noon, and the icefoot appears along the strand. Then it is that the last snow bunting flits away from Thule and the Eskimo abandon the tupiks for the igloos.

As mid-October approaches, the arc the sun describes across the southern sky grows daily shorter, the hours of night grow longer and darker, and sunrise and sunset fast merge into one continuous flush over the southern sky; on October 21 the last thin wafer of the sun's red disk slips along the horizon due south, and winter and night again become one and the same. The icefoot forms firm and fast along the shore, and rapidly the fjords and bays freeze over.

During this period the blubber lamps in the igloos are kept going continually to light the igloos and keep them warm. If the blubber supply be inadequate only one lamp suffices, but if it be abundant, two large lamps are generally kept going most of the time. The light that enters the igloo through the window is never sufficient for the interior. Yet the Arctic night is not so dark nor so disheartening as the imagination of temperate and tropical peoples is wont to picture it. Even when most intense at winter solstice, the Arctic "midnight," the dark-

ness, except in times of heavy cloudiness and storm, does not approach the utter blackness of tropical midnight. For ten to twelve days of every month the moon circles the sky, often when in its fullest phase; the brilliant stars Vega, Capella, Arcturus and others in the magnificent Arctic constellations that revolve about Polaris almost at the zenith, give noticeable light; most of the light that falls from moon and stars is reflected from the glittering snow and ice fields; and the eyes of the Eskimo, like those of the animals and birds that winter there, become adjusted to the diminished light, and all activities go on but slightly retarded or restricted by the absence of sunlight.

Then about mid-January the soft rose and gold of the noonday flush reappears on the southern horizon and waxes longer and brighter each day until at noon on February 21, the upper limb of the sun, large and red, gleams soft and bright above the southern horizon for a few moments. The sun has come back. The long night is over. The next day the whole sun appears, and seems to roll along the horizon a few degrees for a few minutes; the next day it has risen quite above the horizon and covers an arc of several degrees; the next few days the time and the arc lengthen fast.

In a month, when the vernal equinox has come, the sun is above the horizon for twelve hours, and sets for twelve hours; but because of the brilliant twilight the day is really almost or quite eighteen hours in length, and night is reduced to a scant six hours of darkness—a pale gray darkness that is not darkly black even at midnight.

When first the sun appears in February it gives merely a red light, with no appreciable heat; it lies so low in the sky that most of its heat rays are filtered out. At the vernal equinox the sun is a scant twelve degrees above the horizon at noonday, less than one-eighth the way to the zenith, about as far as it has risen at half-past seven that same day in New York. Even at midsummer height at the time of the summer solstice, the noonday sun at Etah is not quite thirty-six degrees above the horizon, less than ten degrees higher than the midwinter noonday sun at New York.

These low-angled rays of the sun reflected from the snow and ice clad surface, can have but little heat effect, though they serve to light the land brilliantly. The advantages of the steep southward facing cliffs upon which the sun's rays fall most perpendicularly during the period of early spring sunshine, is thus emphasized. As the sun rises higher in the sky, the cliffs and steep slopes are heated even more rapidly, and as the arc of the sun's route across the sky is extended farther northward each day until sunset and sunrise merge due north, even

the northward facing cliffs share in the direct heat, though noon on the northward facing cliffs and midnight on the southward facing cliffs are cold and chill in shadow.

On horizontal surfaces the snow and ice do not begin to melt until after mid-April, when the midnight sun begins and the noon sun is eighteen degrees high—and then only in sheltered situations. With the beginning of the twenty-four hour a day sunlight, the snow bunting arrives, and in a few days all the Eskimo are settled for the summer in their tupiks. It is now bright daylight all over Thule continuously, but not until mid-May does general noontime melting begin; and until the first of June the noon temperature rarely rises above freezing on gray or overcast days. The chill winds sweeping down from the great reservoirs of cold off the ice cap and the polar seas to the northward counteract the increasing effect of the sun's more vertical rays until about mid-June.

It is only from mid-June to mid-August that the sun is generally effective throughout the twenty-four hours in melting snow and ice from the flat lands and inland pools. The inland streams and pools and lakes begin to open about midsummer—a few in sheltered recesses among hills or at the foot of southern facing slopes open as early as June first—and begin to freeze at night about mid-August, when the sun's rays at noon again form an angle of eighteen degrees with the earth's surface as they did in mid-April.

From mid-August to mid-October the time of freezing each day lengthens fast. By mid-September most of the streams are frozen dry, and scums of salt water ice form along the shore to spread far out over the sea whenever the wind is in the North or clouds darken the daytime skies. The sinking sun gives little heat for a month before it disappears.

After the sun has disappeared and the cold shadowless twilight of noonday and the gray dusk of night have set in, freezing goes on apace. All land water is frozen, and only high winds and surging waves or racing tides prevent the laying of a solid sheet of ice over the whole sea.

While yet the sun is high enough in summer to yield appreciable heat, cloudy and overcast skies tend to lower the temperature and retard melting. After the sun has gone, low lying clouds particularly tend to blanket the heat given off by the open water. Summer clouds lend chill; winter clouds hold heat.

THE IGLOO OR STONE HOUSE.—When the snow bunting, now a modest symphony of buff and brown plumage instead of the conspicuous white and black of his spring return, begins to assemble in small flocks about the grass tufts and willow mats on the slopes, preparatory to starting

southward, the Eskimo women begin pothering about the half demolished igloo which they must make ready for their winter home. It is half demolished, for when it was last deserted for the summer tupik, the erstwhile residents tore off the roof, and laid the interior open to the cleansing effect of the summer sunlight, of fresh air from the ice cap and the sea, and to the snows and fogs and drizzles, from early May to late September. Germs lurking in the niches and crannies of the floor, or platforms, or walls, can not survive.

The women begin by cleaning out the debris that may have accumulated, rebuild the walls and rearrange the interior. Should unfavorable hunting conditions keep the men at home, they gladly help the women rebuild the house. As the days rapidly shorten and grow colder, the work on the house proceeds more energetically. The roof of flagstones is laid over and covered with grass and turf, the window is built in, the vestibule is repaired; and when the first heavy snow begins to fall and the last snow buntings hie themselves away from the haunts of their summer activities, the Eskimo move their few possessions into the igloo, the interior fresh and clean as in a newly built residence. Meanwhile, the tent is taken down and laid over the roof of the igloo, or stored, and the family is "at home" for the long, dark winter—until the snow bunting comes again.



Courtesy of American Museum of Natural History.

Figure 9. Two igloos of a winter village, built of stone and covered over with snow. The entrance is by a small vestibule and a long tunnel leading up through a hole in the floor just back of the tiny window. The vestibule, the igloo itself, and the little accessory storehouse for skins and surplus equipment constitute the Thule "homestead."

The igloos are built upon a sloping bank to facilitate the construction of the house, and near the shore so that ingress from the sea ice is easy and convenient with dog sledge. They are faced seaward that the home-coming hunter or the welcome visitor may be guided and encouraged while still out on the ice by the cheerful bit of light that gleams from the tiny window; and that the people in the house may look out over the moonlit trail to discover returning sledges.

The locations of the igloos are fixed. Built of carefully selected stones and placed in the most advantageous positions, they preëempt both the best materials and the best sites. New igloos are therefore rarely built; the old, most of them centuries old, are remodeled, rebuilt each year of occupancy, and suffice today.

The type of igloo most commonly found in Thule now is the so-called pear shaped house, with the broader end toward the front, the narrower toward the rear. This type is said to be a modification of an earlier rectangular form, built in a period when large whales were abundant and their long, strong bones could be used in building. Now that these whales are practically extinct, the bones are not available, and only stones can be used. This interesting adaptation of form and character of habitation to changed materials illustrates how effectively a change in environment may evoke a change in culture.

The primitive pear shaped igloo is partly excavated in the hillside, partly built up from rocks and slabs of sandstone, and covered with turf. The rear part of the house, farthest back on the slope, projects least above the surface, and where the gradient is steep, merges so well with the ground as to be practically continuous. The front part of the igloo—little, if any excavated—rises highest above ground. The approach to the igloo leads through a low vestibule that varies in length from ten to thirty feet and is likewise built of stone and slabs, covered with turf. The entrance of the igloo is gained by crawling on hands and knees, among snarling, sleeping dogs, through this long, tunnel like passage, and finally entering by a hole partly in the wall, partly in the floor. Only in times of coldest or stormiest weather is the door closed by a sandstone slab.

In the igloo the basal stones used are large and massive, with smaller stones chinking the crevices left between. Slightly smaller, but fairly equi-dimensional stones are selected for the walls. For the roof large sandstone or slate slabs, anchored and balanced ingeniously in approved cantilever system, are laid across, tier upon tier, from wall to wall, so securely fixed as to bear the burden of turf placed on top, and the snow that may drift high over them.

The bed platform, elevated from fourteen to eighteen inches above the floor, is also built of sandstone or slate slabs supported in front on stones, at the back on the earth itself. It occupies the rear, narrower portion of the house, and is just long enough from front to back to permit an adult's reposing at full length upon it in the middle. The shorter parts of the platform along the sides are occupied by the children. All sleep with their feet to the wall, their heads to the edge of the platform in the center of the room.

The two lobes that project to either side of the front part of the house are given over to two small lamp platforms, likewise built of stone slabs supported upon pillars of smaller stones. The lamps stand on either side of the igloo and at the end of the platform nearest the bed platform. The platforms also serve as shelves for the diverse domestic utensils, a few of the men's smaller implements, the whiplashes, the surplus harnesses, some of the surplus clothing and other belongings, such as tanned skins, harpoon lines, sledge skins; beneath the lamp platforms are stored the daily supply of meat and blubber.

The small floor space left over, three or four feet wide from side to side and at most four or five feet long from front to back, is paved with flat, smooth slate or sandstone slabs. This space comes directly under the highest part of the roof, and affords the adults the only place in the igloo where they may straighten out to full height. From this highest part of the igloo the roof slopes slightly toward the back and toward the sides. The front wall is nearly vertical.

The window is placed in the front wall, just above the door. It measures about two feet wide and two and a half to three feet high. A broad window sill, ten inches or a foot wide, forms a niche in the wall for storage or as a seat. The "window pane," which is almost flush with the outer side of the wall, is made from the intestines of a seal, dried and slit, and the strips sewed together, and into a border of stronger seal skin. This window lets the light in, but because it is translucent only, a peep-hole in the center is necessary to look through. The gutskin from which the pane is made, lends itself admirably to the purpose; it does not break easily when cold, frost does not form readily upon it, moisture does not rot it, and heat is not readily translated from the inside out, or cold from the outside in. The tiny peephole is a veritable gauge, indicating by the volume of steam that issues and the velocity of its escape, the presence of people within, the temperature of the interior, and whether or not cooking be going on actively.

The igloo is well ventilated. The heavy bad air escapes by the entrance in the floor nearly always open. The lighter bad air that gathers in the top of the igloo escapes through a hole two or three inches

in diameter in the middle part of the roof just above the edge of the bed platform, which the Eskimo designate the "nose" of the igloo and which resembles a tiny chimney. This hole is ordinarily kept closed by a bunch of grass, but when the Eskimo mistress of the house detects by the yellowing flame of her blubber lamp even before any odor or oppressiveness is noticeable, that the air is becoming vitiated, or deficient in oxygen, she removes the grass plug. Immediately the air circulates vigorously through the igloo from the floor entrance to the roof chimney, and quickly refreshes the whole interior. The lamp then burns clear white again.

The walls and roof of the interior of the igloo are sheathed with seal skin, light colored, and tanned over the entrance, and with skins on which the hair has been left, over the bed platform. Part of the summer tupik may constitute this sheath.

When thus constructed and sheathed, the igloo is warm, cozy, and comfortable. The blubber lamps easily keep it at a temperature of from sixty to seventy degrees. When once the great stones in the walls and roof, insulated by turf and snow, are thoroughly warmed, they hold the heat equable for hours. The lamp, which furnishes both heat and light, is a shallow bowl or pan, carved from soft soapstone in a half-moon shape. It is set upon three or four small stones so that the front, straight edge is only slightly lower than the back, crescentic edge.

Blubber from sea animals constitutes the fuel for the lamp. Best of these, because it burns clearest, cleanest, and most brightly and gives the most heat, is the case-oil taken from the skull of the narwhal and beluga; the next best oil comes from the blubber of these two animals, and from an occasional whale stranded upon the coast; and the poorest is the blubber of seal and walrus generally used, nevertheless, when the more desirable blubber supplies fail.

Moss provides material for lamp wicks. It is dried thoroughly, and reduced to powder by rolling between the palms of the hands. It is then placed in a narrow ridge about a quarter of an inch high along the straight edge of the lamp, to serve as a wick. The length of the wick determines the length of the flame and consequently the amount of heat generated. The wick, once well laid, lasts for hours, but requires almost constant care to keep it burning uniformly and without smoke. It must be replenished with fresh moss occasionally where it burns dry or becomes defective. The mistress of the igloo is responsible for the condition of her lamp, and prides herself upon her skill in keeping up a steady, bright, warm flame. When she is absent or occupied with other duties, her husband, the children, or casual callers may tend the lamps for her.

The lamp is lighted by saturating a small bit of wick with oil expressed from the blubber, and igniting it. Should the supply of matches be exhausted, the lamp is lighted in the primitive way by striking sparks from a fragment of arsenopyrite with a bit of basalt or steel. The sparks fall into a small, fluffy pellet of willow-down tinder set in a little hole grooved with the finger nail into a cake of dried, oil saturated moss. When the tinder begins to smoulder, it is fanned into flame and quickly the moss in which it is set blazes up like a torch. If a neighboring igloo already have a lighted lamp, the fire may be obtained there. When the supply of matches is exhausted, the fires are carefully guarded and maintained, for in this land fire means life.

THE IGLOOYAK OR SNOW HOUSE.—The iglooyak or snow house, which the Polar Eskimo builds for temporary habitation, demonstrates in a superior way the ingenuity of his adaptation to the conditions of his land. To build a house of perishable snow as a shelter against wind and frost seems paradoxical. Yet the iglooyak is not only casual protection for the hunter against the rigor and inclemency of Arctic weather for a day or two on the trail; it may be the comfortable, commodious home for a whole family for weeks and months at a time, when an igloo is not available or the season unfavorable for a tupik. It presents a unique triumph of human skill over stern necessity and want of resources.



Courtesy of American Museum of Natural History.

Figure 10. The snow house or iglooyak is one of the cultural achievements and extreme environmental adaptations of the Polar Eskimo. Built from hard-packed felt-textured snow blocks, the snow house is a comfortable temporary residence and welcome shelter from the very low temperatures and occasional high winds of winter and early spring.

The snow of which the iglooyak is built must be carefully selected. The Arctic snow generally crystallizes as attenuate steel like spicules that bind together in drifting like fibres of cloth, instead of "fluffing" together loosely as do the flakes of more southerly snows. The wind-packed snow selected for the iglooyak must not be too soft, for if it be, then the iglooyak will quickly settle together and fall in; it must not be too hard, for if it be, then it will conduct the interior heat outward too fast, and the exterior cold in, and provide at best a chilly home.

Suitable snow discovered and a favorable site chosen, the Eskimo mark out a circle as large as they desire the iglooyak to be. If a drift of the right slope and consistency of snow be found, the rear part of the circle is marked up over the drift, so that the higher drift may be shaped into the bed platform. The snow for the iglooyak is cut with a snow knife into blocks about two and a half to three feet long and from fifteen inches to two feet wide, and then pried up with the toe, at a depth of from six to eight inches, the thickness of the blocks.

A group of three men can work most satisfactorily in building an iglooyak. One cuts the blocks and pries them out; a second carries them from the block maker to the builder; and a third builds the house. Of these three the most adept must be the builder; and in the whole Polar Eskimo group, though all can construct a satisfactory iglooyak, only a few are considered master builders with ability to shape the house to perfection for permanence, symmetry, and size. Considerable skill is likewise required for breaking out the blocks in uniform size and thickness, and with despatch. Three energetic skilled Eskimo can erect a substantial iglooyak in less than an hour.

Upon the circle marked in the snow, a row of snow blocks is set vertical and beveled to fit firmly edge to edge, with two massive blocks in the position where the door is to be cut. About the middle of the rear blocks a sloping notch is cut in the circle into which the first block of the second tier is placed at an angle, and the second tier is thus begun and continued on around the circle. When the first sloping block of the second tier is met, the third tier continues uninterruptedly on over it so that from that point onward the blocks rise helically tier upon tier. Each successive tier is beveled more sharply and tipped inward more abruptly until the final block is laid in, quite horizontal, at the top, like a keystone in an arch, and the iglooyak stands almost as solid and substantial as if it were built of stone. An arched entrance is then cut in the two massive blocks laid for that purpose in the foundation circle, half the door being carved from each block. All the crevices between the blocks are chinked with snow, and a big snow block is cut to close the door.

The iglooyak is designed much like the igloo, with the same interior arrangement. The highest part of the iglooyak is at the front over the middle. From this the sides slope away gradually toward the rear, more abruptly toward the sides, and the front wall is well-nigh vertical. The size and height vary with the number, stature, and wishes of the builders. For a temporary shelter for a single sleep or a few days' rest, it is not built so large or commodious as for a semi-permanent residence or for a big group of hunters. An adept snow-mason suits the house to the needs. The ordinary iglooyak for three men on the trail is about ten or twelve feet in exterior dimensions, five to seven feet in height.

The rear half is occupied by the snow bed platform upon which the skins and sleeping bags are placed; the sides accommodate the smaller lamp platforms and such equipment as may be stored upon them. The "floor" is but a small space.

For ventilation, as in the igloo, a small hole is cut in the highest part of the roof, and a small snow chimney is built up about it for draft. This orifice may be closed with a snowball when desired. As long as the snow is fresh and not sealed by melting and refreezing of the interior surface, the air in the iglooyak is pure, because the snow, like charcoal, takes up gases in almost unlimited quantity.

For semi-permanent residence the iglooyak is sheathed with an insulating interior layer of skins that prevents the direct heat from the lamps melting the "ceiling." The lamps are kept burning with smaller flame than in the stone igloos or the skin tupiks, the temperature is kept lower, usually between 45° and 60° Fahrenheit; hence the snow melts but little and not often. If it should melt and drip, or run down the sides, a ball of soft snow is attached to the ceiling to take up the water as fast as formed. The little snow chimney in a semi-permanently occupied iglooyak is kept open most of the time; when cooking is going on, it steams like an engine. In the Arctic, nothing seems so suggestive of home comfort and peace as a settlement of stone igloos covered over with white snow, or an encampment of clean iglooyaks, when on a calm, clear day in early spring at a temperature of forty degrees below zero, every little snow chimney puffs forth into the golden sunshine its slender column of white steam.

Small store rooms are generally built near the house to keep safe from the dogs the surplus furs and clothes, the tupiks and kayak skins, harnesses, thong and whiplash, and other belongings not needed in the igloo. All about a winter village are built solid, high cairns of rock with steep walls which the dogs can not scale, and upon which are stored for safety, the sledges, the kayaks, frozen carcasses of seal, floats for

harpoon lines, and all the other fur and skin equipment that hungry dogs might mutilate or devour.

DRESS

The Polar Eskimo must be clothed in warm, durable dress to withstand the long, almost continuous cold, and strenuous struggle for livelihood that they must ever face. There are no fiber plants to supply textile for cloth of any kind, but from the native animals they obtain suitable and adequate furs and skins for every item of their garb. The clothing materials, the thread, the needles, even, are animal products—skins and furs, sinew and slivers of bone. Like the clothing itself, the method of preparing it, and the art of sewing reflect the simple and direct influence of the environment.



Courtesy of American Museum of Natural History.

Figure 11. The sinew used in sewing is shredded by the teeth from the dried flank tendons of caribou and narwhal. The threads from narwhal sinew are longer and finer than those from the caribou, but not so strong.

MATERIALS.—The seals supply some of the most important garments—mittens, boots, summer coats and trousers—and the narwhal the longest, strongest strips of sinew for thread. Of the land animals, bears furnish the material for men's and boys' trousers; foxes and caribou, the material for men's and women's coats; dovebies, murrees, eiders, and other birds the material for underwear; hares, stocking material and

needles; caribou, the skins for sleeping bags and mittens, and blankets for the bed platform in igloo, tupik, or iglooyak. These yield all the clothing materials.

Not only are skins and furs the sole clothing material available, but they are warm, practicable, and suitable to hard wear and exposure. Furs and skins are warm enough for the coldest weather and they are windproof; and they are easily kept dry. The fine, needle like snow of the Arctic that drives before the high polar winds penetrates into any kind of clothing and can not readily be removed from cotton or woolen cloth; from fur and skin clothing it can easily be beat out. The whole secret of keeping warm in the Arctic consists in keeping the clothing dry. Only fur and skin clothing answer this requirement under Arctic winter conditions when the snow spicules drift before the wind, and there is no sun to dry any dampness that may form.

The snow beater, a double-edged flat piece of bone or driftwood about eighteen inches long with a shapely handle, is an indispensable bit of equipment for the home and the trail. It hangs at the door of the igloo or the iglooyak, and from the upstandard of the sledge. The Eskimo and his snow beater are well-nigh inseparable. Whenever he enters the tent, the igloo, or the iglooyak, and often when he pauses to rest on the trail, he beats the snow from his clothing. If he were to come into a warm place without doing so, the snow would melt, the clothing would become damp, and as soon as he went out into the open again, it would freeze solid. Furs and skins can be readily kept free of snow, and so kept dry.

TANNING AND SEWING.—The tanning is all done by scraping and chewing. No tanning materials are found in the land; if they were, leather tanned by ordinary methods of civilization would be useless for most of the year because it freezes so hard and stiff at sub-zero temperatures that it cannot be worn. Ordinary leather, tanned with tan bark or chrome, becomes brittle as glass and almost as fragile, at forty degrees below zero, and is cold as ice.

Leather tanned by chewing, if properly cared for, keeps soft and pliable as chamois even at fifty degrees below zero, and is always warm. Most of the tanning is done by the women. An Eskimo woman begins chewing when a mere child four or five years old, and chews more or less continually throughout her life. Her teeth are worn down to the pulp by the age of thirty, and to the gums by the age of forty-five.

A small part of the leather for certain purposes, particularly where flexibility is not required, is merely scraped carefully, staked out on the ground to stretch and dry, and then worked over with a scraper and

softener. The skins for the tents are generally thus prepared. The skins for the kayaks are prepared in a distinctive way to be described later. For boots and for a few other special purposes sealskin may be split into two layers, the stronger outer layer being used for the uppers of both men's and women's boots.



Courtesy of American Museum of Natural History.

Figure 12. Every Eskimo woman is an excellent seamstress, and if there be any measure of feminine worth or superiority, it lies in the ability to sew well, and to bear children. The clothing is all of skins or furs sewed with sinew thread, and exceedingly well adapted to the rough wear and the cold weather.

Sewing is carefully done. The flank tendons of caribou and narwhal supply the sinew for thread. Caribou sinew is softer and more pliable, but it is considerably shorter than the sinew of narwhal. The latter is twenty to thirty inches long, the former is but twelve to eighteen, so that it can not be used satisfactorily where long seams must be sewed. The sinew is painstakingly dried to prevent its getting too stiff and brittle, without being damp. The great advantage of sinew over linen and cotton thread lies in its tendency to swell when wet, and thus to fill the holes made by the needle, making well-sewed seams water tight, a matter of primary importance both for sledge-hunting when the snow is drifting and for kayak hunting when the spray is dashing. The pieces of sinew are shredded between the front teeth. The primitive needles made from the splint bones of the hare or gull, other fine slivers of bone,

or the incisors of the Arctic hare filed thin are, at best, heavier and make larger holes than the steel needles which of late years have replaced them.

The somewhat prehensile toes of the women aid in keeping the edge of the skins and furs stretched as they sew. Distinctive stitches are employed for certain purposes, as for instance in attaching the sole of the boot to the uppers. The Eskimo seamstress sews "away" from herself, instead of toward herself as the white woman does, and wears her thimble on the forefinger.

EFFECT OF CLIMATE.—Temperature primarily, and precipitation secondarily, affect the character of the Polar Eskimo costume and the several garments that constitute it. Men and women wear somewhat different dress, and seasonal changes are necessary in both. Since the climate is so powerful a factor in the Eskimo clothing, it can not be ignored.

The climate of Thule is characteristically Arctic. Long, very cold winters and very short, cool summers; relatively slight precipitation, nearly all snow; four months continuous sunlight, four months continuous absence of sun, and two periods of alternating day and night; slight diurnal variability in temperature and wide annual range; a retarded annual minimum—these distinctions of climate Thule shares with all lands of high altitude.

Yet Thule, despite its far Arctic location, never becomes so cold in winter as many lands farther south. Whereas temperatures of -75° Fahrenheit have been recorded from interior Canada, and -90° F. from interior Siberia, over 10 degrees latitude farther south, the lowest recorded in four years' observations by the Crocker Land Expedition at Etah, one of the northernmost villages permanently occupied by the Polar Eskimo, is -42° Fahrenheit. The ameliorating influence of the open water in Smith Sound and to the southward, so modifies the winter temperatures that the thermometer rarely drops to -50° Fahrenheit anywhere along the coast; and the adiabatic effect of the descent of the air over the steep coastal cliffs, or down the glaciers from the ice cap further tends to prevent very low temperatures. The combined effect of open water near shore and descending air from the plateau and ice cap is to keep the average temperature rather uniformly near -10° Fahrenheit for the coldest three months, January, February, and March, except when the foehn, a not infrequent wind along the Greenland coast, raises it almost, or even quite, to freezing.

The ice cap exerts less influence upon the Thule climate than might be supposed. Though one of the three Arctic cold poles is situated in

north central Greenland, inland from Thule, the plateau is so high that the cold air which flows down toward the coast is warmed adiabatically, and when it reaches the coast is many degrees warmer than when it lay on the ice cap. In summer the ice cap is a great reservoir of cold, but even then it does not have so great a direct influence as does the freezing cold water of the sea with its fleets of melting bergs and floes.

In winter the character and extent of the ice rim that freezes along the shore has a most profound effect upon the winter temperature. If the ice freezes in a period of calm and sharp drop in temperature it may be so solid and strong that it does not break and open readily, but lies as a fairly continuous insulator between the relatively warm sea water and the air for some distance out to sea—except off the capes that project farthest beyond the general trend of the coast, where the tides run strongest—when this happens, the winter temperatures are likely to drop to lower minima and to remain at generally lower average levels, than when the ice freezes slowly, or when it is broken and piled into ridges and drifts by storms while freezing.

A heavy snowfall on the ice accentuates its insulating effect. In seasons of calm and quick freezing combined with heavy snowfall the winters are most likely to be severe and enduring.

The temperatures of Thule suggest a marine climate, albeit an Arctic marine climate, despite the concealing effect of the long icelay. The ameliorating effect of proximity to the sea with its relative equability of temperature, is generally obliterated in lands bordering upon the polar seas by the ice which forms over the waters and prevents their heat from escaping to the air; but in Thule, where the rushing tides of Smith Sound keep the water open all winter long the sea makes the coast appreciably warmer in winter and colder in summer than it would be if characteristic Arctic conditions prevailed.

In all data recorded for Etah by the Crocker Land Expedition the extreme minimum temperature is reported to have been -42° F. In 1913-14 it was -36.2° F., occurring on March 13; in 1914-15 -42° F., occurring on March 10; in 1915-16 -28.8° F., occurring on February 1, and in 1916-17 -35.8° F., occurring on December 24, 1916. Thus the average minimum for a period of four years was -32.1° F., considerably higher than for interior Canada or Siberia, much farther south. The ameliorating effect of the nearby open sea is clearly revealed in this relatively high average minimum.

The extreme maximum recorded for Etah by the Crocker Land Expedition was 63° F. For the summer of 1914, it was 61° F., on July 22; of 1915, it was 63° F. on July 1; of 1916, it was 53° F. on July 14 and 29; and of 1917, it was 57.5° F. on July 12 and 14. The average

extreme maximum for the four years is thus but 55.3° F. The tempering effect upon the summer of the cold waters of Smith Sound, with their fleets of melting fresh water icebergs, and their great rafts of melting salt water icepans, extends well over even the widest peninsulas of Thule.

The range between the extreme minimum for the four years, and the extreme maximum was 105 degrees, a clear indication of the marine effect. The extreme range for 1914 was 97.2 degrees; for 1915, 89.2 degrees; and for 1916, 81.8 degrees. The average extreme range for the three years was 89.4 degrees. The lowest temperatures come in March; the highest in July. The lag of increase in temperature behind the return of the sun is a noticeable feature of all Arctic lands, and Thule offers no exception. Spring does not become evident in Thule until well into April. Likewise the extension of summer temperatures well into September and the lag of decreased temperature behind the disappearance of the sun is distinct and characteristic. The most abrupt changes from month to month come between April and May, when the temperature rises twenty degrees, and between September and October, when the temperature falls eighteen degrees. January, February, and March, the coldest months, vary less than four degrees in average temperature and but little in range. June, July, and August, the warmest months, vary about six degrees in average temperature and but slightly in range. July is the only month in which the average range lies quite above freezing.

The average daily temperature, the average daily and average extreme maxima, the average daily and average extreme minima, and the average daily and extreme range, for each of the months of the year, as determined by the Crocker Land Expedition, are indicated in the following table:

MONTHLY TEMPERATURE AVERAGES

	JAN.	FEB.	MAR.	APR.	MAY	JUNE
Average Temperature.....	-13.3	-15.8	-12.7	-1.62	21.3	34.7
Average Daily Maximum.....	-9.1	-11.8	-7.6	3.1	25.4	39.2
Average Daily Minimum.....	-17.4	-20.0	-20.0	-6.6	15.6	29.7
Average Daily Range.....	8.3	8.2	12.4	9.7	9.8	9.5
Average Extreme Maximum.....	7.9	4.0	10.3	20.0	40.0	53.2
Average Extreme Minimum.....	-28.2	-29.5	-32.1	-19.5	1.2	22.6
Average Extreme Range.....	36.1	33.5	42.4	39.5	38.8	30.6
	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Average Temperature.....	40.9	37.3	25.5	7.5	-6.8	-7.5
Average Daily Maximum.....	46.7	40.1	28.4	9.7	-3.2	-3.1
Average Daily Minimum.....	34.1	32.0	22.9	3.5	-10.4	-11.2
Average Daily Range.....	12.6	8.1	5.8	6.2	7.2	8.2
Average Extreme Maximum.....	58.6	53.6	38.6	28.5	11.7	11.8
Average Extreme Minimum.....	27.1	22.4	14.1	-7.3	-21.2	-27.5
Average Extreme Range.....	31.5	31.2	24.5	35.8	32.9	39.3

Spring comprises the period from the first appearance of the sun on February 21 to the first midnight sun on April 21, the period of lengthening day and shortening night. Summer is the season of continuous sunshine from April 21 to August 21. Autumn comprises the period from the first sunset at midnight on August 21 to the disappearance of the sun at noon on October 21, the period of shortening day and lengthening night. Winter is the season of total absence of sun, from October 21 to February 21. Allowing ten days for the effects of the disappearance and reappearance of the sun to become appreciable, spring may be considered to begin on March 1, summer on May 1, autumn on September 1, and winter on November 1. The seasonal average daily and average extreme maxima, minima and ranges, are indicated in the following table:

SEASONAL TEMPERATURE AVERAGES

	SPRING	SUMMER	AUTUMN	WINTER
Average Temperature.....	-7.2	33.6	16.5	-10.9
Average Daily Maximum.....	-2.3	38.0	19.5	-6.8
Average Daily Minimum.....	-13.3	27.9	13.2	-14.8
Average Daily Range.....	11.0	10.1	6.3	8.0
Average Extreme Maximum.....	15.2	51.3	33.6	8.8
Average Extreme Minimum.....	-25.8	18.5	3.4	-26.9
Average Extreme Range.....	41.0	32.8	30.2	35.8

The rise in temperature from spring to summer is pronounced. The average temperature for spring is -7.2° F., and for summer 33.6° F., a difference of 40.8 degrees. The drops from summer to autumn and from autumn to winter are not so abrupt—from 33.6° F., in summer, to 16.5° F., in autumn, and -10.9° F., in winter. The average temperature for winter is but 3.7 degrees lower than for spring. From May to October inclusive the average range lies above zero, from November to April inclusive the average range is below zero.

A continuous, extensive, prolonged ice cover lowers the average temperature and retards the advance of spring. A heavy mantle of snow upon the ice so accentuates the effect of the ice cover that a season of heavy snowfall coincident with a season of continuous icelay results in extreme low temperatures almost or quite until May. A season of widespread open water issues a relatively mild and equable spring, cloudier and foggier than one of heavy and extensive ice. Spring and summer advance more steadily and gradually when the water is open; more belatedly and suddenly when the ice is continuous and extensive. These differences in spring weather conditions, have a profound effect upon the hunting and other activities of the Eskimo well into the following summer.

Absolute humidity is low throughout the year, being highest in the summer months of melting snow, open seas, and continuous sunshine, and in the autumn months of falling temperatures, and lowest in late winter and early spring when the ice is most continuous, the temperature lowest, and the sun's rays too low angled to melt any snow.

Relative humidity is probably highest in winter when the vapor from the open water drifts in toward the land to meet the cold air along the shore lowest in summer and autumn. The few observations available from Kangerdluak and North Star Bay indicate that this relation holds. Comparison with the complete and long records from Upernivik, the nearest permanent station in Danish Greenland, are not justifiable because ice conditions and currents about the skerries of that coast are quite different from those of Thule.

The number of clear days far outnumbers the cloudy and partly cloudy days during the year. June is the month of most changeable and cloudy weather. The autumn, winter, and spring months are dominantly clear and fair. Cirrus clouds are commonest, stratus clouds frequent, cumulus clouds rare even in summer, and true nimbus clouds almost unknown. The higher forms of the clouds are frequent.

Fogs and mists hang over the open water much of the winter, but only infrequently do they drift in over land. Only rarely do fogs occur in summer. Hazes of drifting snow, and of suspended ice particles are common in winter. Beautiful halos are formed in these snow hazes, and their vivid colors continue from the bases of the bow in broad bright bands on the ice that converge to the observer's feet. Mock suns and mock moons sometimes occur, and halos and coronas are very common. On all clear days in early spring while yet the sun is low, mirages continuously bound the horizon.

Snow falls every month of the year, the heaviest generally in late spring or early summer, and in autumn. The winter snowfall is relatively slight, and in places such as at the base of some of the higher cliffs, quickly evaporated. The snow of the cold winter and spring months is in the form of sharp needlelike spicules, but in summer and fall it is flaky and soft.

Rain falls occasionally in June, July, and August, and when the foehn prevails, may fall even in midwinter. Most of the rain comes as a drizzle. Heavy showers and downpours are almost unknown, and lightning and thunder occur so rarely that they are merely traditional among the Eskimo.

Freezing begins in August, as soon as the midnight sun sinks below the cliffs and mountains. Melting ceases about the same time, and the

streams become frozen dry by early September. New ice begins to form in the calm bays by mid-August, and covers them by mid-September. Melting does not begin again until late in April, the lakes and streams begin to open in early June, and the salt water ice begins to break up and drift to sea in late June. The calm inner reaches of the bays do not open fully until late July or early August.

DESCRIPTION OF COSTUMES.—Of all the Eskimo clothing, nothing causes so much thought or requires so much care as the foot-gear, particularly the boots, or *kamiks*. The under-foot conditions both on land and sea are a harsh test of foot-gear. The sharp edged elastic debris into which the rocks of the terrane are riven by frost, and the equally sharp edged bits of ice that cut like knives at sub-zero temperatures, quickly ruin all but the finest of Eskimo tanned leathers.

The sole leather for *kamiks* is prepared from the choicest, most carefully selected skins of the bearded seal, thoroughly chewed until nought but the fiber remains. This then constitutes a durable, satisfactory leather, almost indestructible except by the long wear. The uppers for the *kamiks* are prepared from split ringed seal skin, thoroughly tanned, and bleached by hanging near the shore where the sea breezes blow freely over it. The soles are sewed to the uppers with sinew, and the needle does not pass wholly through from one side to the other of either but somewhat edgewise. The edge of the sole is "crinkled" or "erimped" to shape to the foot, somewhat as an Indian moccasin. All the seams of the *kamiks* are water tight.

Men's *kamiks* are short, the upper edge coming just below the knee. A puckering string about the upper edge draws them tight. A lash of heavy sinew, passed over the toes through projecting "ears" left for the purpose along the edge of the soles, then crossed over the instep and finally tied in a bow knot at the back of the boot, just above the heel, helps to hold the boot firmly in place on the foot, and prevents the sole turning and the seam wearing. This boot lash is an ingenious device, both practicable and necessary.

The women's *kamiks* are longer than the men's, coming well toward the hips. The uppers for these long boots are tanned and bleached to a paper whiteness. The portion above the knee is wide and loose; below the knee in front, a well shaped piece of heavy stiff leather is inserted to keep the front of the *kamik* from slipping into wrinkles. The same kind of lashing is used by women as by men.

Men's stockings are made of the warm white skin of the Arctic hare, the only excellent stocking material for temperatures of twenty-five degrees or more below zero. These furs are very fragile, and must be

donned and doffed with care to avoid tearing. Women's stockings are usually made of caribou skin; but when designed for long travel under extreme weather conditions, the feet may be made of hareskin.

A pad of dried grass is inserted between the sole of the *kamik* and the sole of the stocking to absorb the perspiration from the foot and the dampness that seeps through the sole in travel on salt sea ice. This pad may not be omitted without freezing the feet in short order. Often after a day's travel the grass pad freezes to a solid cake of ice, but the hare skin stocking remains cosy and dry as when first donned. In cold weather the pad of grass must be replaced every day; to leave it too long invariably results in a frozen foot.

On the trail, when the weather is very cold, men, women, and children wear low "over-shoes" of bear skin, caribou skin, or musk ox skin, to keep the feet from freezing, and insert insoles of fur under the stocking to help keep the feet warm. To maintain the foot wear in good condition is the Eskimo's chief concern, both at home and on the trail. During the cold season particularly, no small part of the women's work consists in drying, repairing, and keeping soft and pliable, the foot gear of the family, especially that of the hunter, upon whom everyone depends for the necessities of life. Feet frozen from exposure or defective foot gear all too often lead to a temporarily crippled hunter, and period of stress for the family, unless the meat caches are well stored.

Because they must often crawl over sharp ridged snow, or steely bare ice, and ride for hours on rough sledges or sledge covers, the men of the group require the most durable material in their trousers, and so, men's trousers are made from bear skin, one of the finest examples of suitability to a definite purpose that the Eskimo economy exhibits. Bear skin wears like iron; it sheds water and does not mat; it may be easily beaten free of snow; it is warm in winter, and cool in summer; and it is easily washed in snow. The trousers come down to the tops of the boots, and extend up to the natural break between the hips and body. They are loose and easy, and hang from the hips without belt or suspenders. So distinctly a product of the bear are the trousers that they are called *nannookies*, which means "of the bear, *nannook*."

Only the men and boys wear bear skin trousers. The women's trousers are short trunks of fox skin that extend from the tops of the high *kamiks* to well up on the body. Three fox skins, two blue and one white, are required for a woman's trousers, and these are carefully selected, tanned and sewed. The women wear thin pliable seal skin drawers, but the men wear none at all.

In cold weather both men and women wear bird skin undershirts, sewed from the soft feathery breasts of dovebies, murrees, and eiders.

These require much work in tanning, drying, and sewing; the skins are fragile and tear easily; the feathers are worn next the skin, and become the happy home and hunting grounds of "cooties."

The upper garments are distinctive. For warmer weather the *netchiak* or seal skin jacket is worn by both men and women. It is sewed from the soft, pliable skins of young seals, worn with the hair of the skin outside. It extends below the edge of the trousers, and at both front and back has a short extension or "tail" in the middle, to which in times of wind and cold a thong may be tied from one to the other to keep the jacket down. The "hood" fits close about the face and head; the woman's cap fits close to the face and under the chin, but over the head projects far out, probably to include the "chignon." At the chin, about the wrists, and sometimes about the lower edge, a fringe of bearskin is sewed on to keep out wind and snow. In fact all the clothing is especially designed to keep out wind and snow. Whenever the weather is fair and mild, even in midwinter, the hood is thrown back by both men and women, their long, thick hair sufficing to keep their ears and heads warm.

For colder weather both men and women wear similar jackets of fox skin called *kapetaks*; but since fox skin is more fragile than caribou skin, and not so easily kept free of snow, the men's winter jackets are preferably made of the stronger material. These caribou skin jackets, called *kooletaks*, are worn solely by the men and boys, never by the women or girls. They are durable and well suited to the hard conditions of the case and the trail, but are stiffer than the fox skin in *kapetaks*. Both are cut on the same pattern as is the *netchiak*, but instead of bear skin fringe, a roll of blue fox skin is sewed about the face; nothing is needed for the wrist. An interesting feature of the caribou skin *kooletak* is the fact that the head of the skin is used for the hood, and the ears are left projecting. This little conceit amuses even the Eskimo.

Mittens are usually sewed of seal skin. For the sledge men particularly, other warmer materials are too clumsy to permit handling the whip, and only in times of greatest cold are bear skin or musk ox skin mittens worn. Pads of grass are worn in the mittens when winds or great cold are encountered by the dog drivers. In extreme cold weather, bands of fox skins are tied about the legs where the trousers and *kamiks* meet, but ordinarily nothing is needed there.

There is no "change of style" in the Polar Eskimo dress, for the clothes they wear now are the replica of clothes worn a century ago and more; but withal, the pattern and style are both artistic though severely simple and utilitarian. So skilled and ingenious are the Eskimo seam-

stresses that they cut and fit the clothes without measuring, even when designing and sewing the clothing for strangers. The costumes as a whole are pleasing, and appropriate to the land.

Though not an article of dress, the sleeping bag is so necessary a part of every hunter's equipment that it may well be considered in this connection. Without it he could not rest comfortably when out on the long hunting journeys for caribou, bear, and musk oxen; and on some of his longer travels across the ice cap, his efficiency would be impaired without it. He works hard and long, and goes without sleep until exhausted; then when he rests and sleeps he must be comfortable as possible.

The best sleeping bag is made from caribou skin. Musk ox skin and bear skin, sometimes used as substitutes, are cold as the air outside, and must be warmed by the body before they become comfortable. When hungry and fatigued, the Eskimo finds it difficult to warm these sleeping bags before he himself becomes thoroughly chilled. In contrast, the caribou skin sleeping bag is warm and cosy from the very first minute; there is the same difference between a caribou skin sleeping bag and one of musk ox skin or bear skin that there is between a thick woolen rug and a bare hardwood floor.

The sleeping bag is made from two or three caribou skins sewed lengthwise edge to edge and at the narrower end. It is made as snug as is consistent with comfort, for a large sleeping bag is difficult to keep warm. The hair side is turned inwards. A long flap is attached to one side and this flap is laid on the under side. After the Eskimo has slipped down into his bag, he draws the flap in over him in cold weather, and leaves a small opening through which he breathes. In milder weather he may leave the flap open.

All the clothes are removed when retiring into the sleeping bag, in order to keep the perspiration, and so the dampness, at a minimum. A damp sleeping bag, that is frozen together when not occupied, and that must be thawed out by the feet and body to enter it, is an abomination, and may become impossible of occupancy until thoroughly dried. The sleeping bag is indispensable in cold season travel, but is not needed during the warmer part of the sunlit season.

A thick seal skin is laid beneath the sleeping bag to keep it from direct contact with the snow; for a snow bed is always chosen in preference to a land or stone bed, because it is softer and can be shaped more comfortably to the body.

In the Eskimo clothing the character of the Arctic climate is reflected more clearly than in any other of their possessions or their activities. The fact is quite evident that the only material available is animal in origin. No textile materials are at hand; there is no art of weaving;

woven clothes are impracticable in a land of prevalent fine, wind driven snow. Warmth, comfort, and durability are necessary qualities in the clothing and these the Eskimo find in their simple, but tastefully designed, and carefully sewed fur and skin clothes.

FOOD

The food and clothing of the Polar Eskimo are all derived from animals. The long, almost continual cold and the strenuous struggle for existence require a heavy diet of meat and fat, and a wardrobe of warm, durable furs and skins. The animals supply them. There are no vegetable foods, no textile cloths woven of fiber. Thus the animal resources of the land lend themselves to human needs as shaped by the climate.

SOURCES AND CHARACTER.—The Polar Eskimo are exclusively carnivorous. Their simple and monotonous diet contains no element directly derived from plant sources, except the few leaves of mountain sorrel and scurvy grass that the women and children sometimes gather to savor their soup, and the rare feasts upon the bitter contents of the storage paunch of the caribou and musk oxen which, because the hunting grounds are so far from home and family, the men alone enjoy. Animal food is all they have.

And yet this diet is sufficient and healthful. The children thrive upon it, are content with it, and grow strong and sturdy upon it. The nursing baby, three months old, contentedly sucks at the teat of blubber that his mother gives him instead of her breast when she is busy and he cries for food; the children find as much satisfaction in the frozen eyeball of a seal or a bit of bear gristle as the children of the Southland do in a lump of maple sugar or a stick of chewing gum. The men smack their lips over *mattak*, the tough but appetizing skin of the narwhal and beluga, or revel in warm, sweet *tinguk*, the raw, bloody liver of the newly killed walrus; and the women know no delicacy to compare with the marrow broken out of the shin bones of musk oxen and caribou, or the sweet, juicy meat of the young glaucous gulls. Seal meat does not pall upon them though they eat it year in, year out; it is their staff of life. Bear meat and walrus meat, hare and eider, salmon and dovekie; raw, frozen, or cooked; all are edible, appetizing, hunger satisfying, strength giving.

The meat need not even be fresh; it may be months old, or it may have been stored a year or two; it may be so "high" that it smells to heaven; yet good it seems to the Eskimo if it feeds their hunger, strengthens their arms for the hunt, their legs for the trail, and keeps the family and dogs from famine and starvation. The foods of civiliza-

tion tickle their palates, tempt their taste, and may even spice their meats, but for "real" food they turn from them all to a good solid meal of seal or walrus or the other animals that their land nourishes.

From the sea animals—seal, walrus, narwhal and beluga, and bear—the Polar Eskimo obtain the bulk of their food supply. They depend upon the ringed seal for their steady diet. The ringed seal is not so vagrant as the other animals, and holds more closely to the bays and fjords where, all the year round, conditions are safest and surest for hunting, so that only disastrous seasons bring failure to the ringed seal hunting. The flesh of the ringed seal is greasy and dark, and tastes somewhat fishy. The blubber is a yellow, sweet fat, somewhat like that of fowl, and quite palatable. The flesh and blubber are cooked together. All parts are eaten but the flipper shoulders are considered the choice morsel. A fully grown ringed seal yields over a hundred pounds of meat. At certain times of the year the flesh smells and tastes strongly of musk, and then though eaten when necessity demands, it is not relished by even the Eskimo.

The bearded seal, a much larger animal than the ringed seal, yields more meat and blubber. Though tougher, it is less greasy and fishy in taste. If ringed seal be not available the Eskimo consider the bearded seal a satisfactory substitute for daily food. The bearded seal is generally less abundant than the ringed seal, though locally and seasonally about as widely and uniformly distributed along the whole Thule coast. Like the ringed seal, the bearded seal has favorite haunts where he is relatively numerous but he avoids other places.

From the narwhal and beluga the Eskimo obtain great quantities of soft meat, rather insipid, and blubber that is more fluent, and softer at house temperatures, than that of seal or walrus. If other food supply be available, the meat of these porpoises is eaten only occasionally for variety, and the blubber burned in the lamps. It is the great slabs of skin, the *mattak*, that the Eskimo most highly prize as food. It keeps well, holds its flavor tenaciously, and satisfies hunger. It is generally eaten raw, but when cooked it tastes wholly different, though still very good.

For quantity of meat no animal equals the walrus. A full sized animal yields hundreds, almost thousands, of pounds of palatable food. The flesh is sweet and solid like beef, but generally tougher. The blubber is solid, not so readily melted as that of seals and narwhal, but like the blubber of seal, good food. An abundant reserve of walrus in the caches insures against famine and want throughout the dark cold season, not only directly for the Eskimo themselves, but indirectly as dog food.

These five animals, the ringed seal, the bearded seal, the narwhal, the beluga, and the walrus, supply the Eskimo larder with the great quantity of meat and blubber necessary to stave off hunger and starvation. They are the primary source of sustenance, as they are of fuel, light, material for artifacts, and to a lesser degree, of clothes.

The polar bear is eagerly hunted, partly for his meat, but more for his pelt; yet in villages near his most frequented haunts, bear meat forms a considerable though casual part of the dietary. A full-grown polar bear yields hundreds of pounds of meat; the meat from old bears is tough and tastes strong, but the flesh of young bears is delicate in taste and texture.

Caribou venison is a luxury. Only the saddle is fleshy enough to supply much meat, so this alone is brought home from the distant pastures where the caribou are killed. These saddles are treasured and eaten sparingly. Men, women, and children delight in both raw caribou meat and the cooked venison. Caribou tallow and marrow are highly prized. The hunters store the tallow in their sledge bags, and break open the bones and extract the marrow, to take both home to the women and children. It is the warm skins of the caribou for sleeping bag rather than the venison for food, however, that lure the Eskimo across the ice cap every fall to the distant, isolated caribou grazing grounds.

Hunted primarily for his white fur, so essential for stockings, the Arctic hare nevertheless affords the Polar Eskimo a pleasant relief from the diet of heavier meats. The flesh makes a savory stock for soup that the women and children relish and the doughtiest hunter does not disdain. Few are the villages that cannot find some Arctic hare on the slopes about. In the short crisp days of September and early October when the young hares are full grown, fat and tender, the Eskimo women, as well as the boys and men, like to take an occasional jaunt over the hills and into the valleys, for hares and ptarmigan before the dark comes on. The flavor of ptarmigan and hare is much the same, probably because they feed on the same plants. Both are stewed in the same pot and can not be distinguished by the novice.

Soon after the ice begins to freeze in the bays and fjords, the Arctic fox assumes his winter pelage and begins plundering the caches of seal and other meat that the hunters have made under rocks along the shore. Then the trapping of these creatures begins. In early winter, while still fat, the foxes are good to eat. Not infrequently the strong smell of stewing fox indicates that the traps have yielded another fine fur to grace a *kapetak* and another fat, vulpine carcass to enrich the larder.

A significant element in the whole domestic economy of the Eskimo, the bird life, contributes vitally to the food supply. Though the estival

bird life of the Thule waters is the most numerous and the most conspicuous in the landscape, it does not constitute a major element in the food supply; it is significant because it is critical, saving the group from extinction many times in the past and still tiding it over times of stress when substantial foods are exhausted.

The most important birds that supplement the food supply are the dovekies. When they return to the land, the Eskimo women lay up a goodly store under the rocks for winter use, without removing the entrails or plucking the feathers. When other food runs short or a change in diet is desired, the Eskimo hunters bring home the cache from the scree where the women made the depots the summer before. The mass of birds, all frozen together into a lump, is not appetizing to contemplate. The feathers are matted together, a leg sticks out here, a beak there, and the smell that emanates is sour enough to discourage any appetite not accustomed to it. The birds have not spoiled while lying under the cold rocks, but in the slow fermentation of the contents of their digestive tracts, the flesh has been permeated and flavored by the subtle gases exuded.



Courtesy of American Museum of Natural History.

Figure 13. The dovekies, small diving birds slightly larger than the robin and shaped somewhat like ducks, are the most numerous of all the Arctic birds. They constitute a reserve supply of food in critical times of poor hunting conditions, or in times of ample food, a welcome change from seal and walrus diet.

The birds are pried out of the frozen mass, dexterously skinned, and eaten whole—insides, bones, meat, and all except the bills and feet. They are considered a treat. A frozen mass of several hundred birds suffices a hungry family of three or four but a day or two.

In the Melville Bay region, where the summer is warmer and longer, some putrefaction might take place if the birds were cached only under rocks; there another method of preserving and storing them has been devised, which has resulted in an even more highly prized luxury in the diet. When several hundred birds have been caught they are slipped into a bag made of sealskin, from which the carcass has been extracted through the mouth and all other apertures sewed up. A great part of the blubber layer is left on the skin. Sometimes alternate layers of dovekies and narwhal blubber are deposited within the bag, instead of only dovekies. The fat from the blubber slowly saturates the birds, and renders them so appetizing to the Eskimo palate that the temptation to eat them before need arises is almost irresistible. No delicacy compares with this *Kiviak*, as it is called; and the guest who is given free access to a skinful of these blubber saturated birds may consider himself favored by this utmost evidence of his host's hospitality and friendship. Care must be taken to cache these skins of birds under rocks, for the least sunlight makes them bitter.

Not all the dovekies are cached and stored. During the netting season they constitute the daily food of the villages accessible to the serees. When the fledglings are nearly full-grown the women and children roam over the serees, seeking out the young birds in their nests among the rocks, to eat them raw, or, having assembled a number, to take them home for a delicious stew. The eggs too are eaten. Every Eskimo mother stores away a few to give her little ones, as southern mothers would candy or cookies, when the heavy, wearisome winter diet of seal and walrus irks the children's appetite.

Less important than the dovekies but none the less a considerable item in the year's food supply, is the eider, the large, black sea duck from which the Icelanders and the South Greenlanders obtain down. When in late June and early July the eiders nest on the rocks and skerries along the coast, the Eskimo of the nearby villages repair to the nesting grounds for a summer holiday. Men, women, and children join in the picnic, for picnic it is. It is the season of joyous summer, blue skies, calm seas, blooming flowers, teeming game, and ample food. The eider nests dot the islets, in every niche and grassy tussock. The happy Eskimo snare some of the birds, store hundred of eggs under the cold rocks and in shady crevices to freeze until needed to eke out the stores for the winter larder. They also make "sausages" of hundreds more by sucking them, masticating the whites and yolks together, and expectorating them into casings prepared from seal intestines. The "sausages," like the eggs, help to vary the monotonous winter diet of stored meats.

In late summer, just before the ice freezes, the young fledgling eiders that have not developed the wing feathers necessary to flight, are fat and plump, and easily captured. As the close of the kayak season approaches, and the Eskimo hunters cruise about the leads and pools still open in the freezing ice, they miss no opportunity to add these tender ducklings to the day's booty, and make them part of the day's food.

One other bird, the murre, contributes to the dietary of the villages adjacent to the great cliffs of Parker Snow Bay, Saunders Island, and to a slighter degree a few other bird cliffs scattered along the coast. The murres, like the dovekeys, are caught in nets from accessible ledges on the cliffs, and are cached in the talus slopes at the foot. Larger birds than the dovekeys, they would yield a greater supply of food except that they are more wary and less easily netted, and consequently a day's catch usually does not bulk so large as a day's catch of dovekeys. The eggs of the murres are locally gathered in considerable numbers, but not so generally as the eider eggs.

In the netting of both the dovekeys and the murres the weather plays a controlling part. When the wind is high the birds fly higher and farther from the screes and cliffs and so beyond the reach of the nets.



Courtesy of American Museum of Natural History.

Figure 14. Though the men of Thule do most of the hunting, the women shere in netting birds and trapping foxes and hares by deadfalls, and lines of nooses strung low over rocks. Furs from animals caught in deadfalls are not so likely to be mutilated as those caught in the steel traps that are now generally used.

If the air be foggy or hazy the birds can not be discerned in time to prepare for their coming. If the weather be cold, the women are uncomfortable and less agile. A calm, clear, mild day affords ideal conditions for netting.

The other birds play but a minor rôle in the dietary. The fulmars arrive earliest in summer. Though not particularly relished, they are a welcome relief from the long winter's scarcity of fresh meat, especially to the villagers along Wolstenholme Sound. The glaucous gulls are large enough to warrant the expenditure of ammunition, but the old birds are tough, and only the young birds of the season are really palatable. The ivory gulls are sometimes killed in early summer. The brent geese, snow geese, old squaws, and ravens are occasionally killed and eaten, but they are negligible elements in the food supply. The ptarmigan likewise, though appreciated as a choice morsel, is killed only for a short season in the fall when the young are fat and tender, and so unwary as to be easily caught.

The only fish that the Eskimo uses is the salmon. He spears these along the shore or in the little streams, as they shoal to the summer spawning grounds, or in the fresh water lakes either through the ice during the frozen season, or along the shore in the open season. Relatively few are taken, but these few are highly prized.

Shell fish are obtained only from the storage paunch of the walrus killed. The Eskimo thus obtain a limited number of clams and scallops, which they usually eat raw while they flense the huge animals and store away the meat. They pick them out of the digestive juices, tart and sour like mayonnaise dressing, and eat them avidly. Sometimes when several walrus are killed and cut up near a village, the women collect a pot of the shell fish, wash them in salt water, and cook them to make an appetizing dish.

But salmon and shell fish are negligible. A few of the mammals, notably the seals and walrus, yield most of the food and are thus of primary importance in the dietary. A few others, in general merely augment the food supply, though in certain localities they sometimes become crucially valuable. None of the birds add much to the ordinary food supply, but the dovekie is critically important to whole villages in times of impending starvation.

To the bird cliffs the old couples, the infirm, and the crippled hide themselves in summer, in order to help as much as possible toward the winter's reserve. By sustaining themselves at the bird cliffs while the season of plenty continues, and even helping lay aside a store of birds and eggs, they conserve part of the summer's kill.

STORAGE OF FOOD.—Storage of food from the summer's kill for the winter's supply has been developed almost to an art among the Eskimo. Whenever the Eskimo kills a surplus above the day's need, he caches part of it on the shore nearest the hunting ground because he does not wish to haul a heavy load farther than necessary. Part he brings home and caches near his igloo for ready supply when ill weather or indifferent ice prevents his hunting, or even forbids his sledging out to his farther caches. It serves too for adequate supply when the winter visiting season begins and he entertains friends and relatives who come to tarry a time with him. Hospitality demands that he share his store freely with his passing guests after the manner of the group. When he in turn becomes guest, they stint not in their care of him and his family.

The game is usually cached beneath large rocks and slabs of stone, piled high to keep out foxes and bears and vagrant dogs. The meat does not spoil, for refrigeration is excellent. The rock or ground upon which the caches are built is always cold; the rocks and stones with which he covers the meat are chilled; thus the meat keeps well and does not spoil for several years. And what if it does turn a little? So long as it is not putrid, it is nourishing and may be eaten. Much of the meat is eaten raw, both from choice and from necessity. In the Arctic no cooked meat is so tender and palatable as frozen meat. The liver, heart, brains, kidneys, all the vital organs are frequently eaten raw, either freshly killed or frozen. These probably furnish the vitamins so necessary to a healthful ration. None of the food deficiency diseases occur, except in times of starvation; this fact may be ascribed to the habit of eating raw meats. Often fire for cooking is not possible, and then the raw meat diet become a necessity.

COOKING.—Boiling is almost the only method of cooking. Frying and roasting are impracticable because the fuel and cooking utensils do not lend themselves readily to those methods; the odor and smoke would be intolerable in the igloos and the tupiks; the haphazard habits of eating, with no set times for meals and each member of the household eating when he is hungry, precludes the possibility of keeping cooked meat warm except in the broth of the pot over the lamp.

The broth from the cooking of most of these meats is consumed both on the trail and at home. Before tea was introduced to the Polar Eskimo, his only warm beverage was broth, and even to this day, it is his most satisfactory drink when he is cold and fatigued.

A little meat is dried every year, preferably the blood rich flank of the narwhal and beluga. This *nipco*, as it is called, is made by hanging long strips of flesh over rocks out of the reach of the dogs, where the

sun can thoroughly dry it. Only a limited quantity of this is prepared, as an emergency ration for long journeys where food may be scarce, and as an occasional relish in the home.

The food supply, the way of storing it, and the methods of cooking it are thus as direct a reflection of the physical conditions as are the villages, the homes, and the home equipment. The character and monotony of the diet, the scarcity or plenty of the supply, and the thought and thrift shown in obtaining it, storing it, and using it, all illustrate the compelling influence of the environment. Nothing may be wasted; everything must be used; all must be shared; these are laws that Nature has laid down for the Polar Eskimo if he would not starve.

HUNTING

The activities of the women of the Polar Eskimo group have been incidentally but adequately described in the accounts of their homes, their clothing, and their food. The activities of the men are chiefly concerned with hunting, the sole industry in which they may engage.

Upon the success of the chase depend the comfort, health, happiness, and the very life of his family. From the animals that he kills he obtains all the necessities of existence. This primitive activity, above which the Polar Eskimo has not risen, is consequent upon both the utter lack of resources other than animals, and the relative scarcity and monotony of even the game supply. An available surplus of meat, or furs, or blubber, might conceivably give rise to manufacture or commerce; large productive pastures might encourage herding and pastoral industry; but neither of these is possible. And though the supply of game that is available might well sustain a somewhat larger population in Thule, any undue expansion of the hunting would quickly destroy any surplus that might exist, and in a short time encroach upon the number necessary to maintain the stock undiminished.

Limited thus to animal resources the Eskimo engages in the one activity upon which his existence depends. He has shaped his entire way of living to the demands of the chase. His villages are located in relation to the hunting grounds; his clothing is designed for life in the open, on the trail; his equipment is fashioned for the chase and his days are spent in its craftsmanship and in its use; his thoughts are occupied with the weather, the ice, the sea, and their effect upon the game; his greatest delight comes in a successful hunt, and his soundest satisfaction from well filled meat caches, a well conditioned dog-team, and a well provided family.

WEATHER AND ICE CONDITIONS.—Because their hunting and sledging activities are so closely dependent upon the weather and ice conditions, these two dominating factors must be briefly described.

When the dark season begins in October usually after the autumn caribou hunt, the domestic activities are restricted to the stone igloo. The water is everywhere covered with ice, the ground with snow, and cold and dark make indoors preferable to outdoors almost all the time. The weather in the early part of the dark season is generally clear, crisp and calm, but when storms break over the coast they bring strong winds and driving snow, when it is both dangerous and uncomfortable to be out on the sea ice. Since this is the season of first icelay when the winter visiting from village to village begins, the Eskimo—men, women, and children—study the signs of the weather anxiously. When the skies clear off and the stars come out sharply brilliant after a storm, the weather is likely to be favorable for sledging; but during this season the tides must also be attentively observed. The long sledge journeys must be planned for the period of neap tides when the ice forms undisturbed by such vigorous tidal currents as in the period of the spring tides. During the monthly spring tides the ice breaks up easily, and in offshore winds of stormy weather drift out to sea. Sledging is then quite hazardous, and every hunter dislikes to take the risk of being carried out with the ice or the inconvenience of following the ice foot for long distances.

As the winter night advances, the ice grows thicker and sledging becomes safer. During the moonlighted periods visiting among the villages is constant, and hunting continues unhindered. During intervals between moonlight, activities are restricted, particularly when drifting snow and storm make the night all the darker.

With the return of the sun, the extreme cold continues to keep the Eskimo more disposed to stay within doors than outside, and it is not until the annual gathering of the whole group off Capes Chalon and Saumarez in March that outdoor life really begins. This is a season of extreme low temperatures, calm and clear for days, with occasional periods of blustery, stormy weather.

The darkness of winter, and the cold of early spring help to promote an intimate, cordial home life within the tiny one-room igloos where everyone must be considerate, tolerant, and helpful, if peace and comfort are to prevail. The incessant visiting, the free hospitality, and the fraternal coöperation that this season fosters tends to develop a strong bond of common interests and widespread comradeship throughout the group.

As spring advances, the midnight sun begins, the ice breaks up, and the weather changes. During May and early June it is generally pleasant. The snow begins to melt away from the hills, the streams bubble down the rocky valleys, the grasses and flowers burst into bloom, and the birds come back. Game is abundant, and *utok* hunting on the ice engages the hunters all day long and provides ample food for the family.

The latter half of June is changeable and stormy. Snow one day, fog the next, sunshine the next, drizzle the next, and wind and calm and storm succeed in rapid order. The ice rots fast, and begins breaking away. Leads and pools open wherever the tide runs strong.

With the beginning of July comes real summer. Open water extends far into the bays, and pools and great leads permit kayaking almost everywhere. The snow is gone from the hills, and the lakes are open. The birds bring forth their young and the waters are alive with game. The sun shines warm and clear all day long. The air is soft and fresh and balmy. It is the time of joy and plenty and excitement for the whole tribe. Everyone lives out of doors every waking hour, and often sleeps in the sunny lee of a warm rock ledge. The skin tupiks, pleasant and comfortable as they are, are almost unfrequented.

This pleasant season continues until after mid-August. Then the nights begin to grow chill, young ice forms on the bays, the plants wither down, and the birds begin to leave. Flurries of snow become frequent and the wind waxes strong. The Eskimo women gather dried grass for the bed platforms of their igloos, begin building up the walls and laying over the roof, and finally move from the tupik into the igloo. The hunters barely take time to sleep or rest, but spend every moment possible out upon the sea in pursuit of migrating narwhal and beluga, and fat seals and walrus.

Then fall comes on, and snow and darkness. The ice puts an end to open sea hunting. The women sew the winter clothes. The hunters make new harnesses and repair the old, set their sledges in order, and polish the runners. The dogs know that the glad life of the trail is soon to begin, and wait impatiently to don the harness. It is time for the autumn caribou hunt.

At any time in the year, the foehn, or rather the south wind, may blow and bring with it a whole series of conditions unfavorable to outdoor activities and unpleasant to domestic affairs as well. The weather may become so warm that the snow melts on the roofs of the igloos, the snow houses melt down and the ice rots. The fur clothing becomes damp or wet; the lashings of the sledges loosen and let the runners flatten out; the caches of meat, blubber, and birds thaw and run, the

drying skins soften and stretch unduly. The wind may blow so strong that the ice breaks away from the long stretches of shore, and huge drifts of snow pile up on the ice foot.

The sea ice ordinarily begins to form in the calm reaches of the innermost fjords in early September, and does not usually break out completely from some of them until mid-July or even later. In unfavorable years the ice may not go out at all, but lies solid and unbroken from one season to the next. In Melville Bay to the south and Kane Basin to the north, the persistence of the sea ice for several seasons is not unusual, but in the bays and gulfs between, it is infrequent.

Never, even in the most open summer, do the Thule waters become quite free of icebergs and drifting ice pans. An on-shore summer wind rafts the ice upon the coast and piles it into pressure ridges for miles out to sea. When the currents shift coastward the icebergs drift in to form high blockades across the mouths of the bays. Ice bars Thule by land all the year, by sea nearly all the year.

When the sun begins to sink behind the hills and cliffs in mid-August the first sea ice begins to form during the night hours. At the heads of the calmer, higher walled fjords this ice may not melt, and freezes thicker each day to form the winter ice lay; but in the windswept fjords and in the more open waters the night ice that forms melts as soon as the sun begins to shine upon it. Where there is any convection or movement in the water the ice forms later and more slowly.

By mid-September the winter ice begins to freeze generally. In the smaller bays and narrower fjords it forms fast. In the lee of points and islands it freezes almost as fast as in the bays. Where the tides do not run too strong the ice may freeze from an island at the mouth of a bay to the shore on either side before all the inner reaches of the bay are frozen over, and so an open pool be left within the bay when the ice extends quite out beyond the island. Bays tributary to Inglefield Gulf or Wolstenholme Sound may freeze over long before the rest, but a racing tide or a strong wind may retard or even prevent freezing for a time. About the outer capes, in deep narrow straits, and between steep-walled islands the tide is usually too rapid to permit early freezing.

If the temperature drop suddenly far below freezing, the sea ice freezes thick and solid very quickly indeed. If the temperature drop only slightly below freezing, and the ice freezes slowly, the ice may be rubbery and spongy to a depth of a foot, before the upper crust becomes solid. Ice formed thus slowly is not so likely to break with wind or tide. Whenever the wind blows while the ice is freezing, the ice is heaped up chaotically in ridges and windrows; or if ice already formed

be broken by storm, it may likewise be piled up in cordilleran heaps of sharp-edged blocks.

Smooth ice forms whenever cold, calm weather prevails during the freezing period. In some years of little storm during the autumn months, the ice along the whole Thule coast is smooth and passable. Ice thus formed is not only smooth, but firm and durable; ice formed in time of storm is not only rough but variable in thickness, likely to break with tide and wind, and difficult and treacherous to travel over.

After the ice is formed it may be shattered by an on-shore storm or carried away by a strong offshore wind. Tides between icebergs, over shoals, or around promontories may wear it thin or wholly away. The spring tides may open leads and pools that weaken it, and give the winds and tides purchase to carry it out. Even in the coldest winter the ice may be broken out and drifted away; naturally the longer it lies, the thicker and more solid it becomes, and the more resistant to disruption. When left undisturbed throughout the winter it freezes six to eight feet thick, being thickest where snow insulates it least, and tides wear it least. Such heavy ice holds strongest and longest when summer comes.

Long before the surface of ice begins to melt under the sun, the freezing has ceased and the tides have cut away underneath. The high spring tides of March and April open leads in even the thickest stretches. Then in late April and early May when the streams begin to pour their fresh water in upon the sea, and the sun's rays rise high enough to be directly effective, the ice begins to "rot" and melt away. Pools develop, leads open, lagoons form along shore, the tide cuts away great stretches, and day by day, great fields break off from the margin and drift away. Slowly indeed, but surely, the ice breaks out and finally by mid-July the sea is open. Every little bay and narrow fjord yields up its ice, and with a favorable offshore wind to carry it out, the "coast is clear."

The ice foot, an important and distinctive phenomenon of all Arctic coasts where tides prevail, is that portion of the sea ice that freezes fast to the shore; it does not change elevation, as does the sea ice with every rise and fall of the tide, and is not carried away by the winds and tides. It begins forming as soon as freezing weather begins. As the tides ebb the water freezes; with each ebb the icefoot gets thicker; it forms from the lowest ebb line to the highest flood line. It is widest along a shallow, gently sloping shore, narrowest and steepest along a precipitous shore. Where the shores are very gentle the icefoot may be hundreds of yards wide; along a cliff it may be but a foot, or at most, a few feet wide.



Courtesy of American Museum of Natural History.

Figure 15. The ice foot constitutes the royal highway along the coast for many weeks after the sea ice has drifted out, or in mid-winter when offshore streams have driven the usual icelay away from the coast. The ice foot is generally smooth and easy of traverse, but in places along high cliffs becomes dangerous, even impassable.

Between the fixed icefoot and the movable sea ice that rises and falls with the tide, runs a line or zone of fracture, the tidal crack. On the spring tides, the sea wells up through this tidal crack and floods the icefoot, freezes, and smooths out all irregularities and rough places. Thus the icefoot becomes a stable, permanent, smooth belt of fixed ice along the coast "a royal highway" when the sea ice is treacherously worn, thin, or completely carried away. About the outermost capes and promontories, where in times of storm the surge sweeps in unimpeded, the ice may pile up on the icefoot in high confusion and then the "royal highway" must be traversed most carefully.

The icefoot reluctantly melts away when summer comes. Even with radiation from the land and the boulders rolled in upon it by summer freshets, with streams cutting across it, and the all day sunshine, the icefoot persists generally long after the sea ice has gone out, and affords the Polar Eskimo an easy route from village to village for any belated errand or mission upon which he may be bent.

When finally the icefoot melts away, the glaciers, which debouch upon the sea all along the coast, afford an emergency route to the ice cap if a sledge trip from one village to another is necessary. In summer as in winter the ice cap serves as a possible highway, though in general it constitutes a permanent boundary to all activities.

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